

THE QUARTERLY MAGAZINE OF THE NATURAL
HISTORY MUSEUM OF LOS ANGELES COUNTY
VOL. 11/NO. 4 SPRING 1973

Terra



Dig That Dive!

How about going on an archaeological dig, or an underwater expedition?

The Natural History Museum is exploring the possibility of becoming a co-operating institution with Educational Expeditions International, a small, energetic, non-profit organization offering the ultimate in adventure—a chance to participate in scientific expeditions. This is entirely different from a “study-tour,” for participants are hard-working helpers in serious scientific work in anthropology, archaeology, astronomy, marine biology, ecology. No professional qualifications are necessary, although an effort is made to match applicants’ backgrounds with the scientific needs. Men and women of all ages may apply, and may expect to hike, carry, build, eat field rations, and have the time of their lives in environments ranging from Botswana bushland to clear waters of Caribbean coral reefs. Cost: \$1500 to \$2000, paying your expenses and part of research costs. Information is available from: Frank Arenberg; EEI; 567 San Nicholas Dr., St. 106; Newport Beach; Calif. 92660; phone 714-833-2518. A comprehensive catalogue for 1974–75 will be available in October.

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Washington in Spring

In early April Washington, D.C. greeted our Museum-oriented group of fifteen with full cherry-blossom bloom. Our eight days were filled with great joys and fascinations, with space here for but a few highlights.

After an uncrowded, early-morning V.I.P. tour of the White House, we enjoyed the National Gallery, almost an embarrassment of riches with its own collections and the visiting Impressionist and post-Impressionist paintings from the U.S.S.R.

One day we were off to Winterthur, Delaware and Brandywine Museum, via Kenwood, Maryland, where there is a superb stand of single white cherry blossoms. At the Henry Francis du Pont Winterthur Museum we were escorted through estate grounds past ponds with ducks, geese, and swans, to our appointment with a docent who shared with us such delights as an entire clock shop moved down from Newport, Rhode Island.

Our tour leader of Gems and Minerals

at the Museum of Natural History was Mrs. Henrietta Kellar, whose cousin, Mr. Robert Wade, in on our own staff at the Natural History Museum of Los Angeles County.

The Oriental collection at the Freer Gallery was a special enthusiasm, as we viewed Chinese bronzes of 1500 B.C. and an entire room of Japanese screens.

On a Wednesday we ambled through the country to visit Alexandria and Mt. Vernon, with its vast sweep of lawn and imposing approach. The garden is most charming, with no plants not available in the late eighteenth century. Dwarf espaliered fruit trees (apple, peach, pear) rim the edges of vegetable beds in the kitchen garden. With reluctance we left the high-columned piazza and glorious sweeping view of the Potomac, having first written cards to our congressmen requesting preservation of the endangered view.

So many memories: dining at Kennedy Center by a long window overlooking the Potomac, followed by orchestra or theatre; walking through Dumbarton Oaks with Elizabeth Benson, curator of the Pre-Columbian collection; visiting the U.S. Navy Observatory on an evening so crisp and clear we could view a fiery double star and the craters of the moon looking like giant mud plops; watching playful Ling Ling and Hsing Hsing, Giant Pandas at the zoo; and enjoying a final, unifying review at the Museum of History and Technology. Let's go again, for 80 days!

Alathena Kasten Miller
Tour Leader

Icthyology Notes

Swordfish

Swordfish is being legally sold again in California and reportedly being shipped to East Coast markets in small amounts.

California is the only state to have established an FDA (Food and Drug Administration) approved certification system. According to Federal and State officials, it appears to be working well.

In a recent analysis, 42 of 853 fish samples checked were found to be within 0.5 parts per million for mercury. The FDA standard for mercury in fish is 0.5 parts per million; any sample that exceeds this amount is considered unsafe.



The Quarterly magazine of
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Rx

Take four green frogs...

by Sage Culpepper Belt

Combine "shrub, maple, spignut root, gumfey, white elder bark, and blue flag root, two ounces of each, to four green frogs," steep in hog's lard and strain to obtain an ointment to treat ulcers. "The effect will astonish you" continues the recipe of an old Indian medicine man.

Confronted with the lists of ingredients used in compounding early medicines, one imagines that the results will be astonishing. Bear grease, cow placenta, dragon bones, white clay, roots and leaves gathered under carefully dictated conditions—all hint briefly at the wondrous things man has prescribed for himself and others in his pursuit of health.

Imagine a dusky campfire in a coastal clearing in northern California. Indians gather about it preparing the leaves and berries gathered earlier in the day. One scalds and crushes the scarlet berries

in water to make a refreshing cider, spicy and tart, and prepares surplus fruit for drying to preserve it for future meals. An elderly man spreads some of the leaves to dry and store for *Kinnikinnik*—a name given to several kinds of leaves used for a pleasant smoke or in the sweat bath. He chews other leaves to make a poultice to relieve the rash his young son bears as a result of a recent excursion into a patch of poison oak.

All of these leaves and berries are from the same plant—one called *Kinnikinnik* by the California Indians, *Bearberry* by the settlers, and *Arctostaphylos uva-ursi* by the botanists. A redundant name and a curiosity, since *Arctostaphylos* is bearberry in Greek and *uva-ursi* says the same thing in Latin.

Heirs to centuries of careful observation and living close to nature, the native

American used the plants around him for many things. The plants furnished dyes and fibres for his baskets, waterproofing and tools for his pots, wood and twine to make his weapons. They were shelter and food, accompanied ritual and pleasure, and were a source of medicine.

One of the most significant discoveries for Europeans in the New World was the vast store of medical knowledge possessed by the Indians. The Spaniard Monardes in *Joyfull Newes out of the Newe Founde Worlde* (1574) and John Josselyn in *New-Englands Rarities Discovered* (1672) opened the door to a widespread search for new botanical remedies.

Which of the many plant drugs used by the Indians of North America were actually effective? The medical utility of a plant is due to its chemical constit-

uents—carbohydrates, volatile oils and lipids, resins and resin-combinations, tannins, glycosides and alkaloids. These last two frequently produce powerful medical reactions and are responsible for many of the effects of the following plants.

Glycosides are organic compounds yielding sugars when mixed with water; they involve protective and regulatory functions and are useful in almost every area of medical treatment.

One of the many Indian drug plants benefiting from its glycosides is *Apocynum cannabinum* which contains cymarín, a cardiac drug closely related to digitalis. Members of the willow and birch families and a number of other plants contain salicin, an alcohol glycoside effective in controlling minor pain and fever. Still another is *Arctostaphylos uva-ursi* which contains the phenol glycoside arbutin.

"A low growing shrub, found in large mats."

Bearberry (*Arctostaphylos uva-ursi*) is a member of the heather family which includes the Manzanita so familiar to Californians. Often mentioned in accounts of Indian medicine, it is a prostrate evergreen which grows along the California coast and is indigenous to the northern countries of America, Europe and Asia. Bearberry is represented by over forty species in California, plants ranging in size from the procumbent Bearberry to erect, almost tree-like shrubs. Hikers know and bears love to eat the tiny reddish fruits, the "little apples" for which the Spaniards named the lovely Manzanita. These and other members of the family have stiff leaves, smooth reddish-brown bark and small, urn-shaped pink or white flowers in terminal clusters.

With certain other members of its family, Bearberry has been used for many years as an astringent and diuretic, so one is not surprised to learn that the Indians and early settlers drank a tonic brewed from its leaves for relief from urinary disorders. In addition, they crushed its fruits and leaves to make a decoction to give relief from dropsy.

Indians chewed Bearberry leaves to make an astringent poultice to treat sores and the inflammation caused by poison oak; today an astringent is commercially extracted from its leaves. Bearberry was mentioned also for a number of other ailments including stomach trouble, bronchitis and headache.

By analysis the dried Bearberry leaf

contains two glycosides, arbutin and ericolin, as well as tannic acid, gallic acid and quercetin. Ericolin is a yellow resinous substance reported to be impure arbutin. Arbutin is a bitter phenol glycoside which when reacting with water yields hydroquinone which is antiseptic and reduces fever. Tannic and gallic acid are both astringent and in addition, tannic acid is a styptic, a local dressing for burns and helps control diarrhea. Quercetin is a yellow powdered crystalline compound which has been recently suggested as a treatment for capillary fragility and bleeding.

"an Indian Bruising and Cutting of his Knee with a fall, used no other remedy, than Alder bark, chewed fasting, and laid to it, which did soon heal it." John Josselyn, 1672.

Complex chemical compounds are often restricted to a small number of species, while simpler compounds may be characteristic of an entire family or even a whole class of plants. This seems to be the case of the glycoside salicin, the source of one of the most widely used drugs, aspirin. Salicin occurs in members of the salicaceae (willows and poplars) and in several *Viburnum* species. One of its useful derivatives, methyl salicylate, is found in the beeches, birches, alders and in wintergreen (*Gaultheria* sp.).

Many of these plants have long been used in popular medicine and mentioned in herbals as specifics for a variety of ills. Scientific interest in salicin, however, seems to date from late eighteenth century London with the late Reverend Edward Stone's article, "An account of the success of the bark of the willow in the cure of agues." Since fever is a symptom of many illnesses, any effective drug lowering bodily temperature safely was bound to be enthusiastically welcomed.

There was great interest during the early nineteenth century in the properties and chemical structure of the active principle in willow bark; in 1829 salicin was isolated in the pure state. Further research led to salicylic acid in the 1830's and, spurred by the need to find an inexpensive antipyretic, scientists produced a synthetic salicylic acid in 1874. Germany introduced its acetyl derivative, acetyl salicylic acid, in 1899 under the trade name aspirin.

Salicylic acid inhibits the growth of microorganisms, a quality which once made it important in the preservation of food and wine. Sodium salicylate and the derivative aspirin have proved the most effective remedies in the controlling of

acute rheumatic fever; another derivative para-amino-salicylic acid (P.A.S.) hinders the growth of the tubercle bacilli and is used in combination with other agents to treat tuberculosis. The Kwakiutl people of the northwest coast used the salicin-rich bark of the red alder in treating tuberculosis.

In 1672 John Josselyn recounts that a decoction of alder bark is excellent to take "the Fire out of a Burn or a Scald" and tells us that "The bark of the Birch is used by the Indians for bruised wounds and Cuts, boyled very tender, and stamped betwixt two stones to a Plaister, and a decoction thereof poured into the wound."

Because they are absorbed through the skin and possess antiseptic and fungicidal properties, salicylates are used in modern medicine to treat skin disorders such as ringworm and to assuage pain in muscles and joints. The softening action of salicylic acid on the corneous layer of the skin makes it useful in treating corns and warts. "This is a singular good herb" Foster wrote in *The North American Indian Doctor*. History has proved his point.

"a deep-rooted plant with erect, smooth and pointed leaves"

Early settlers in this country learned of Black Indian Hemp (*Apocynum cannabinum*) and Dogbane (*A. androsaemifolium*) from the Indians who used it as a cathartic and diuretic. Practitioners of "popular medicine" employed *Apocynum* as a remedy for dropsy, a use which attracted the interest of physicians studying plant remedies of American origin.

Cymarín acts primarily as a stimulant on the heart. Considered today a minor cardioactive drug, because it is difficult to control the dosage, *Apocynum* differs only in the degree of its effects from those of the major heart drugs digitalis and strophanthus; its glycoside cymarín is closely related to many glycosides in the digitalis group.

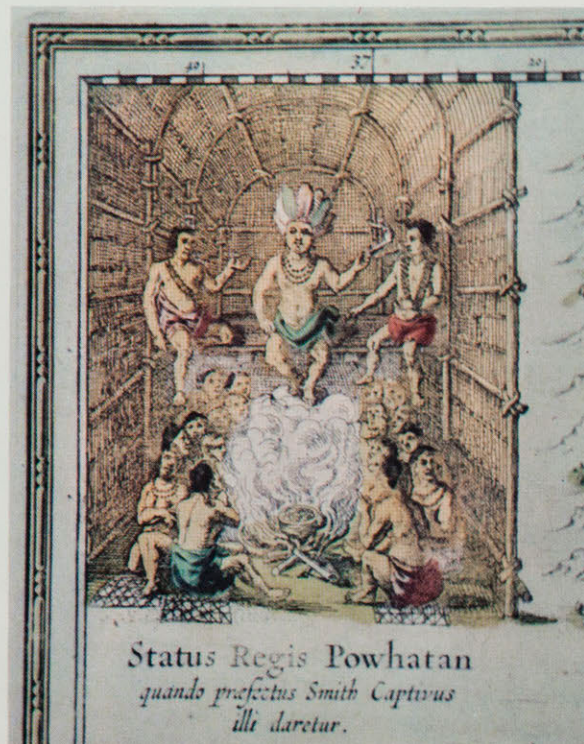
Physicians in the United States used the *Apocynum*, composed of the dried rhizome and root of *Apocynum cannabinum* or *A. androsaemifolium*, as a heart stimulant and cathartic. At one time it was used as a diuretic to treat the edema of kidney failure known then as Bright's disease. Many substances act on the heart and numerous familiar plants are chemically related to digitalis.

Helleborus niger (Christmas rose), *Convallaria majalis* (lily of the valley), *Thevetia peruviana* (yellow oleander) and *Veratrum viride* (green hellebore) all



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Brazilian Indians enjoyed their tobacco in rolls much like the cigars of today. Thevet, 1558.



Powhatan, captor of John Smith, smoking the medicinal and ritual plant destined to be a major economic staple of Virginia. Henry Hondius, "Nova Virginiae Tabula", ca. 1650.



Nicotiana Rustica



6

Bleeding and the use of tobacco were two methods used by the Indians of Florida in the 16th century. Engraved by Theodore de Bry from a painting done in 1564-65 by Jacques le Moyne.



ABACO.



Waxy, urn-shaped blossoms help identify the manzanita (*Arctostaphylos* sp) so familiar to hikers in California. Its red berries make a refreshing cider.

Bearberry and *Nicotiana* were among the different plants used for smoke therapy in the new world. This engraving of Brazilian Indians is from *Les Singularites de la France antarctique*, Thevet, 1558.

Nicotiana tabacum from a book published in Spain in 1671 on Indian plant medicines, Monardes Segunda parte del libro.



have been used to treat heart ailments.

The digitalis effect is not confined to plants alone. A toxic alkaloid, bufotenine, present in the secretions of the skin glands of certain species of toads, causes hypertension and lasting constriction of the blood vessels. Its chemical structure is somewhat similar to the cardiac glycosides and its action is like that produced by adrenaline.

"which is the first plant that springs up in this Country, and the first that withers; it grows in deep black Mould and Wet."

With this description John Josselyn introduced an account of the plant he mistook for the European white hellebore (*Veratrum album*.) It was actually *Veratrum viride*, a closely related plant indigenous to the wet meadows of North America. Because they share the same habitat, *Veratrum* is sometimes mistakenly called skunk cabbage (*Lysichiton americanum*), a large plant also found in open swamps and wet woods. The Indians knew *Veratrum viride* for its medical properties and probably introduced it to the settlers. Its hypotensive, cardiac depressive and sedative action make it valuable in modern medicine.

The active constituents in *Veratrum* are not glycosides, as they are in the willow drugs and *Apocynum*, but alkaloids. Difficult to define because they do not represent any specific homogeneous group of compounds, alkaloids are capable of intense physiological activity. They are mainly basic nitrogenous compounds occurring in plants and occasionally in animals. Various parts of the plants produce them: seeds, leaves, fruit, bark and roots. Pharmacological activity varies greatly. Some will cause a rise in blood pressure, others cause it to fall; some are narcotics, others are stimulants; some cause the pupils of the eye to dilate, others cause them to contract.

The alkaloids of *Veratrum* are similar to those in larkspur (*Delphinium species*), Monkshood (*Aconitum napellus*), and a medicinal plant known to the Aztecs as Sabadilla (*Schoenocaulon officinalis*). *Veratrum* shares cardiac effects with Monkshood and insecticidal properties with Larkspur and Sabadilla. The alkaloids of *Veratrum*, Sabadilla, and a plant used by the Blackfeet and the Salish, the Death Camas (*Zygadenus*) are called the "Veratrum Alkaloids." Current interest in these alkaloids and their use in the control of high blood pressure is over one hundred years old. Their use was begun and abandoned until recently because results with the crude drug were erratic. Recent clinical trials of purified prepara-

tions demonstrated the hypotensive properties of these *Veratrum* alkaloids and they are now being used in combination with the alkaloids of *Rauwolfia Serpentina* to treat certain types of hypertension.

The Salish of the northwest coast valued *Veratrum* highly for its magical potency. They carried its root as a charm to ward off evil spirits and kill sea monsters, a practice reminiscent of the use of the European Hellebore (*V. album*) for sorcery and magical rites. The roots of *V. viride* were used by the Salish in medicinal sweat baths and by the Kwakiutl in minute doses for internal pains and rheumatism. Of the New England area, John Josselyn relates that the "Indians Cure their Wounds with it, anointing the Wound first with Raccoons greese, or Wild-Cats greese, and strewing upon it the powder of the Roots; and for Aches they scarifie the grieved part, and anoint it with one of the aforesaid Oyls, then strew upon it the powder: The powder of the Root put in a hollow Tooth, is good for the Toothache." He suggests "To kill lice, boil the roots of Hellebore in milk, and anoint the hair of the head therewith . . ."

"Nicotiane doth require a fat ground finely digged . . ."

The physician Monardes' report on Indian medicines, *Joyfull Newes out of the Newe Founde Worlde*, first printed in Seville in 1574, discusses the virtues of *Nicotiana*, the plant known to us as tobacco. Describing conditions needed for the cultivation of *Nicotiana*, a plant widely used throughout the tropical regions of this hemisphere, Monardes continues "She groweth the better beyng often wattred, and reviveth her selfe by reason of the water in time of droughtes, she hateth the cold . . ."

The plant received its botanical name, *Nicotiana*, from that of Jean Nicot, the sixteenth century French diplomat who receives credit for first introducing it into Europe. Its popular name, tobacco, is from the Indian name for a roll of the leaves which they called a *tobaco*. This is the genesis of our present day cigar.

There are at least eight alkaloids in *Nicotiana*, the most important being nicotine, a volatile liquid alkaloid, and anabasine, found also in the Russian herb, *Anabasis aphylla*, which is used as an insecticide. Nicotine is an example, as is salicin, of a biosynthetically simple compound found in a wide variety of plants. It is extremely poisonous, a local irritant, a muscle relaxant, and a paralyzing agent.



Black indian hemp and dogbane, two of the popular names given to different *Apocynum* species, refer to the plant's useful fibers and its poisonous qualities. Columna, *Phytobasanos* 1592



William Curtis recommended the bitter willow (*Salix triandra*) as a substitute for Peruvian bark (quinine) in the cure of fever.



The Kwakiutl of the northwest coast used the bark of *Gaultheria shallon* to treat tuberculosis. Another *Gaultheria* is the source for Oil of Wintergreen used for

sore muscles. Photograph courtesy of Robert Gustafson, Dept. of Botany, Natural History Museum of Los Angeles County.



Green hellebore (*veratrum viride*), often incorrectly called skunk cabbage, is a dangerous heart drug which is difficult to control.



Bearberry of Kinnikinnik (*Arctostaphylos uva-ursi*) was used by the Indians for food as well as tobacco and medicine.

Pharmacologically, nicotine first excites, then paralyzes the ganglia, nerve cells usually located outside the brain and spinal cord. Skeletal muscles react in a similar way; during the paralysis phase nicotine exerts a curare-like effect which causes the breathing mechanism to fail. The central nervous system is also first stimulated, then paralyzed, a process which produces unpredictable changes in the body. Nicotine produces disturbances in digestive and circulatory organs and enervates the heart. It is no longer used therapeutically but is employed as an insecticide in agriculture.

Before *Nicotiana* was abandoned as a medicine in 1905 it served a variety of functions. Physicians used it as an antiseptic, a pain killer, an emetic and to induce perspiration. It was an expectorant helpful for colds and respiratory problems.

Considered a poison and used by shaman in ceremonies and ritual, tobacco was also a useful drug for the Indians. They used it as a painkiller for earaches and toothaches; Monardes wrote "it will heal . . . all old sores, and cankered ulcers, hurtes, Ringworme, greate scabbes, what will soever bee in them . . ."

Nicotine is absorbed from the oral and gastrointestinal mucosa, the respiratory tract and through the skin. Of the latter route, John Josselyn says that "With a strong decoction of Tobacco they cure Burns and Scalds, . . . and strew on the powder of dried Tobacco." In like manner the Cahuilla Indians steamed the leaves of *Nicotiana glauca* and applied them as a poultice directly over the swollen glands of an inflamed throat. Josselyn tells us "the vertues of Tobacco are these, it helps digestion, the Gout, the Toothache, . . . it heats the cold, and cools them that sweat, feedeth the hungry, spent spirits restoreth, . . ." He would have many supporters today! For ulcers "Wash the complaining parts with lobelia every day, and make an ointment of green frogs, shrub, maple, spignut root . . ."

So begins Robert Foster, botanic doctor, in one of the 204 "receipts" in his book, *The North American Indian Doctor*. Many of Foster's recipes call for *Lobelia* (*Lobelia inflata* or "Indian Tobacco"), a plant named in honor of the Flemish botanist Matthias de Lobel, physician to the first Stuart King of England, James I.

An annual herb, *Lobelia inflata*, is native to most of the temperate and warmer regions of the world with the exception

of central and eastern Europe and western Asia; it grows in dry places in the northern parts of the western hemisphere. A partial list of some of its other popular names gives us a hint of its reputation: Asthma Weed, Vomitwort, Gagroot, and Bladderpod.

Lobelia inflata contains lipids, resin, gum, volatile oil and fourteen alkaloids of which lobeline is the most important. The pharmacological effects of lobeline are closely related to those of nicotine and a third similar alkaloid, coniine (derived from *Conium maculatum* or Poison Hemlock), an alkaloid which produces motor paralysis without loss of consciousness and is said to be the drug which the Athenians used to kill Socrates. Lobeline produces emetic effects, respiratory paralysis, a curare-like effect on the skeletal muscles, and affects the contraction and expansion of the blood vessels. Like nicotine the drug is unreliable and dangerous and, since 1960, has not been used therapeutically.

Early physicians, learning of its use by the Penobscots of New England, employed *Lobelia inflata* as an emetic, expectorant, nauseant and antiasthmatic. For asthma Foster suggests "Put two teaspoons full of pulverized *Lobelia* into a pint of rum, and use it for a bitter morning and evening. Half a gill will be sufficient at once."

Lobelia inflata held its place in Indian Materia Medica for many of the same reasons for which the settlers used it. *Lobelia* relieved pains in the chest, asthma and inflammations of the nose and throat. As a substitute for tobacco *Lobelia* served ceremonial and ritual functions and was smoked, to a lesser extent, for pleasure. Many other plants were also smoked. The Hopi, for instance, employed at least nine for ritual purposes, only two of which were *Nicotiana* species. Two others, Sage (*Salvia carnosa*) and Mullein (*Verbascum thapsus*) were smoked for medicinal purposes.

At least two other species of *Lobelia* appear in Indian medical lore. One is an erect perennial, the beautiful Scarlet Lobelia (*L. cardinalis*) and the other is the Great or Blue Lobelia (*L. syphilitica*), all relatives of the tiny blue Lobelia so popular in California gardens. The Cherokees employed *L. cardinalis* as a worm medicine and homeopathic physicians used it also, as an antispasmodic. The Iroquois administered *L. syphilitica* in combination with the American mandrake (*Podophyllum peltatum*), wild cherry (*Prunus Virginica*) and New Jer-

sey tea (*Ceanothus americanus*) to victims of syphilis. Both the red and blue Lobelias were used by the Indians as a love potion. Believers ground Lobelia roots together and secretly gave them to quarrelling couples in an attempt to bring them together again.

Thus, many Indian drugs proved useful and were accepted as official drugs by the western nations. Some have since been discarded, not because they were ineffective, but because safer, more easily controlled drugs have been discovered. Others, such as Bearberry have been replaced by synthetic diuretics. Still others are once again under investigation. What a remarkable treasure man has received from the peoples of this continent.

The recipe in the opening paragraph is taken from the *North American Indian Doctor* written in 1838 by Robert Foster. Books such as Foster's fulfilled an important function in a time when the land was sparsely settled and physicians were few. His subtitle explains that the book shows "Nature's method of curing and preventing disease according to the Indians." A botanic physician, Robert Foster included a "Treatise on Midwifery" and a "Catechism of anatomy and physiology" as well as the "Materia Medica of Indian Recipes" containing over 250 recipes and descriptions of the less-common plants.

Five of the remedies mentioned in the quoted recipe were recognized medicinal herbs and possessed some property useful in treating ulcers and skin lesions.

Sage Culpepper Belt has published articles on ceramic technology and African folk art. Her new love is ethnobotany and we can expect more TERRA articles from her in this field. She is a well-known lecturer on the History of Ceramics.

OUR FRAUDS

by Edward C. Wilson



Fig. 1.

One of the unsettling questions that museum visitors ask a curator about his current recondite interest is "What is it good for?" This paper is about rock and fossil frauds, so ask me what a fraud is good for because I've looked it up already in ponderous dictionaries and know that there are several classes of fraud goodnesses. Happily these can be simplified: a successful fraud is good for a giggle, good for a scandal, or good for a bundle. Some are good for all three. Unsuccessful frauds are good-for-nothing bombs, unless perhaps your avocation is litigation.

Probably the most famous of the fossil frauds was perpetrated in Germany in the 18th century. Dr. Johann Beringer (1667-1740) was a physician on the faculty of the University of Würzburg who dabbled in paleontology and employed three fossil collectors. In May, 1725, they brought him some stones that they had unearthed on Mount Eivelstadt. Eventually great numbers of them were found and a few are still in existence. These stones clearly depicted scorpions, snakes, millipedes, salamanders, butterflies, beetles, lobsters, birds, flowers, snails, leaves, clams, worms, spiders, bees, wasps, crabs, and many other animals and plants. Such things do occur as fossils, but Dr. Beringer's stones had the spiders spinning webs, the birds on nests, the bees and wasps at their hives, the frogs *in acto flagrante*, and other unusual activities for fossils. Furthermore, there were fossil suns, moons, stars, and comets complete with tails. One sun had a coy smile and demurely lowered eyes. Some stones had curious writings on them, in several languages.

In legendary Germanic tradition, Dr. Beringer set to work monographing his finds and the following year published the famous *Lithographiae Wirceburgensis*, complete with many plates showing his stones. The most elaborate plate is reproduced here and shows the stones incorporated into a glorious tableau (Fig. 1).

All the while, two of Dr. Beringer's rival colleagues at the University, a professor and a librarian, had been carving these stones and paying one of his collectors to bury them secretly on Mount Eivelstadt. Academic vilification is an old story.

These gentlemen were found out and prosecuted. The transcripts of the trial are still in the Würzburg State Archive. It was too late to save Dr. Beringer's reputation but the poor man tried to retrieve all the copies of his book. Even

this proved useless, because after his death these were re-sold in 1767 with a new title page.

Translations of Dr. Beringer's book and of the subsequent trials, with annotations, appear in *The Lying Stones of Dr. . . . Beringer . . .* by M. E. Jahn and D. J. Woolf, University of California Press, 1963. I highly recommend a reading of this translation of the Beringer text as a real trip into the 18th century mind, enriched as it was with so many more theories of the origin of fossils than we presently enjoy.

Our museum probably never has had a curator in the Earth Sciences Division gullible enough to accept a carved smiling sun as a fossil, but with a few somewhat less obvious specimens—well—move over, Dr. Beringer.

A Sweet Little Concretion. One morning several years ago, I found a former Curator of Mineralogy-Geology crouched in front of his specific gravity balance, muttering angrily to himself. Someone had brought him a rock to identify that had been found under a bridge on the Angeles Crest Highway (Fig. 2). The rock seemed to be a concretion. It was spherical, about an inch and a quarter in diameter, chipped and worn on the outside, split in half by the finder and showing internal concentric rings of pale green, blue, and white around a tiny nucleus that appeared to be a fossil.

The curator had put it through the usual tests: streak plate, hardness, blow pipe, all with unusual results, but the specific gravity test was the most puzzling. In a specific gravity test, a specimen is put under water on a balance and a number is obtained that represents the ratio of the weight of the specimen to the weight of an equal volume of water. This number is very characteristic for different kinds of minerals and is useful in making identifications.

However, the indicator needle wouldn't hold still for this specimen. It slowly but surely crept downwards.

Since only half the specimen was being used for this test, I got out my hand lens and prepared to examine the other half. Geologists generally wet a rock before they look at it under magnification. A common way is to touch it to the tongue. I did so and then suggested that the other curator do the same. This simple test and a little research enabled him to write his final authoritative report which we still have with the specimen:

"Extensive chemical tests reveal this concretion to be a peppermint candy

jawbreaker with a cardamon seed in the center."

The sugar had been dissolving in the water while measuring the specific gravity.

An Ionic Snail. A charming lady from south Glendale came into the museum with a fossil snail one day. Or she supposed it was a snail, she said. A neighbor's son had found it somewhere in Glendale. Already thinking snail, I sat down with her on a hallway bench while she rummaged in her purse for the specimen.

Fossil snail shells frequently are preserved in an unaltered state, that is with the original shell. In many cases, however, the shell is leached away, leaving only the mud-turned-rock that had packed the inside of the shell. These are called internal casts and are variously shaped, depending on the species of snail, but generally coiled. They weather free from many rocky ledges in Southern California.

From her purse the lady fished out a worn, coiled, grayish, rocky looking specimen about 4 inches across, and handed it to me (Fig. 3).

I was well into the explanation of internal casts of snails, which I told her the specimen was, when, carefully turning it around to demonstrate my lecture, I noticed an un-fossil-like feature. I kept on talking on one level and tried to convince myself on another level that it was possible for the space once occupied by the shell to somehow have become filled in places with *burlap*. Then I noticed that the symmetry was too even for most snails and in a flash I knew that it wasn't a snail at all. Or even a fossil.

Ionic, you will remember, is the order of column distinguished especially by the volutes of its capital. These supposedly were inspired by sections of large snails attached to posts by the primitive inhabitants of Greece. Our lady from Glendale possessed a badly weathered, fragmentary volute from a burlap reinforced, plaster ionic capital. It probably once graced the front porch of a modest home.

I never really believed before that they could have been inspired by snails. We discussed this delightful revelation when I gave her lunch—and then she gave us the Ionic "snail."

A Big Fish Story. Dr. Shelton Applegate, our Associate Curator of Vertebrate Paleontology who specializes in fossil sharks, and I were called to La Puente on a wintry day to check a report from a museum friend that she had located

an enormous fossil fish, the backbone of which was at least 20 feet long. We arrived early and found an extensive hilly site being graded for housing. A hasty reconnaissance turned up a few fossil fish scales for us. Our informant came and led us to her specimen which, as is not unusual at construction sites, was covered partly by mud and water, most of it iced over. There appeared at first glance to be a long series of vertebrae, each about 3 inches in diameter, and very regularly spaced out just as they should be in a backbone.

The first thing that puzzled us was that the vertebrae seemed to be the same diameter at each end of the series. One would expect them to get smaller towards the tail end. Then we noticed that the rocks nearby were dipping at quite a steep angle but that our specimen was horizontal. It would be most unusual for a fish of this size to have been buried at an angle greatly discrepant to the rocks in which it occurred.

We carefully lifted out a vertebra and were surprised to find that several others came with it. Cracking through the ice in a nearby puddle, we washed away some of the mud and saw that the vertebrae were connected in an odd way and did not look so much like vertebrae after all.

We found the key to this identification when an earthmover with enormous tires blasted its horn at us and rumbled by. In its wake were four series of imprints formed where the mud had slurped out of its deep tire treads. These were identical to the specimen we had been examining.

At some time this earthmover had driven across a spill of wet cement and part of the track had hardened into a "fossil fish," a piece of which we fondly retain (Fig. 4).

The Copyrighted Mystery Fossil. No other specimen in our paleontology sections has given so many devoted student

Figs. 2–6, all approximately natural size. See text for true identities.

Fig. 2 A sweet little concretion.

Fig. 3. An Ionic snail.

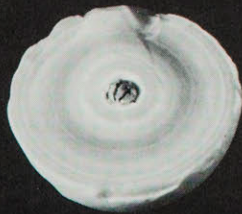
Fig 4. Piece of specimen from a big fish story.

Fig. 5. The copyrighted mystery fossil.

Fig. 6. One of Mount Washington's qiant pearls.



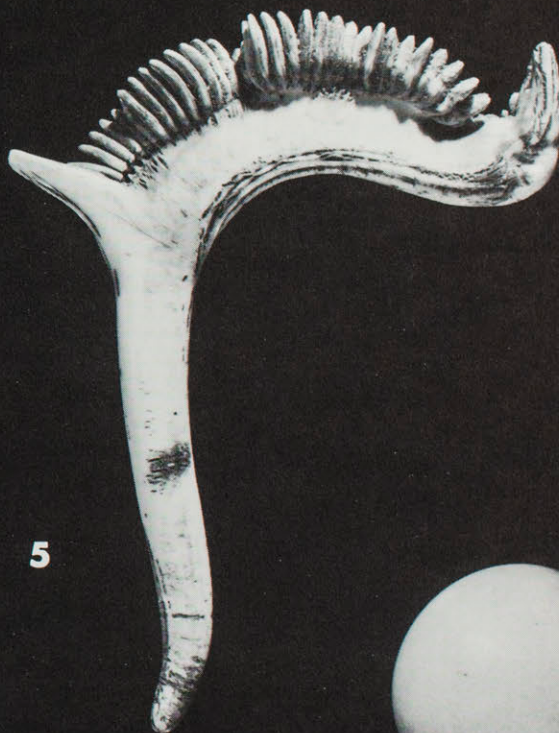
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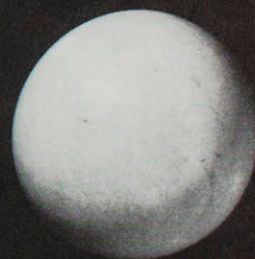
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workers so much perverse glee as an ivory colored, ruinous, L-shaped thing with two large projections enclosing 33 smaller but similar ones at the end. The longer limb of the L is about 4½ inches long. Words fail me in describing it accurately and I refer you to the photograph (Fig. 5). One really must handle it to appreciate its perfection.

This holy relic is trucked out with regularity for famous visiting paleontologists and a ritual gone through which, with some variation, runs like this:

Someone casually hands the thing over and asks, "Now what might this be, Professor X?"

Alerted workers covertly look up to record every reaction. The man knows he is on the spot. Beads of sweat may break out on the tissues covering his frontal bones.

There are only three possible answers. The most honorable one, in the eyes of the audience, is to admit defeat and say that one doesn't know what it is. The most common one is to impetuously guess, and the most common guess is that it is a bony gill raker of some fossil fish, which it vaguely resembles, but is not. The correct answer awaits its Jason, for no one has ever correctly identified the object, not counting the donor, who had the unfair advantage of seeing it created.

After having made his good or bad mark and received the admiration or guffaws of the audience, the man on the spot is handed the label for the specimen. It coyly says:

"WHAT IS IT? Answer on back of label." Turning it over, he reads, to his chagrin and amusement:

"Rat-tail comb that has been in campfire. Collected by W. E. Gelchell, Sherman Oaks."

As a coda to the ritual, a faint but unmistakable trademark may be pointed out, reading simply "Stanley."

We thank you, W. E. Gelchell, wherever you are.

Mount Washington's Giant Pearls. A curator quickly learns to expect the unexpected when his telephone rings. One example is the elderly man who rang up and breathlessly asked me, "Are there such things as fossil pearls?" Yes there are, I told him, although they are rare and generally not pretty as one expects pearls to be. "Does that mean that they might be dull white?" Yes, I answered, they might be. "And heavy?" Yes, again, they might be heavier than one would anticipate. "Well," said the excited voice, "I have just found six big ones

on Mount Washington."

Would I come look? I would.

I arrived at his home on Mt. Washington, that legendary rustic hill inhabited by Los Angeles Times columnist Jack Smith and his amusing pantheon. The gentleman led me inside and showed me six curious spherical objects, each about an inch and a half in diameter, dull white, and as heavy as marble. They were about the size of peppermint candy jawbreakers, so I suspiciously tasted one, with negative results. I put them on a table and rolled them around. They weren't quite spherical. I looked at them under a hand lens. They certainly were dense and I couldn't see any grains. I was at a loss what to say so I suggested that we examine the site where they were found.

A few yards from his back door was a copse of California walnut trees, a veritable haunt for coyotes and racoons. The specimens were found here in deep leaf mold, quite separated from any bedrock. I was mystified.

"Well," the gentleman asked, "Are they fossil pearls?" I told him that it hardly seemed likely that pearls would occur in leaf mold, although they were shaped like one might expect huge pearls to be. "Aha," he retorted, "Then what are they if they are *not* pearls?" I borrowed one, giving him the I'll-take-this-back-to-the-laboratory-for-examination speech. In return, he gave me a glitteringly triumphant look.

This was a tough assignment. A fossil pearl should fizz when put in hydrochloric acid. It didn't. A fossil pearl should scratch easily. It didn't. A fossil pearl should break rather easily, but I found when I dropped it accidentally onto the cement floor that it bounced. I needed professional assistance, so I consulted my fellow paleontologists.

We all agreed on one thing—it wasn't a fossil. Not bone, not shell, not wood. Certainly not pearl. It looked and acted like a ceramic ball, but how do you convince a man whose mind is made up to having six fossil pearls that they are ceramic balls of some unknown function? I needed that function.

I carried the specimen in my pocket for a few days, handing it casually to staff members in the elevator and elsewhere for suggestions. There were no results until I tried it on John Dewar, our omniscient Curator of Social and Cultural History.

"Well," he said, "A ball mill ball." And that's what it was. Ceramic materials, such as clays and glazes, are mixed in

a machine like a concrete mixer and special ceramic balls are added to speed the mixing process. I checked it out with a Santa Monica ceramic company and found that they used identical balls in their mixers, as well as some black limestone stream pebbles, some of which *did* have fossils in them.

This was carefully explained to our friend on Mt. Washington, who graciously let us keep one of the balls (Fig. 6). Of course, he didn't believe a word of it and set right out to find the oysters that had made his big "pearls."

Maybe all of the noises that Jack Smith hears under his house are not his aire-dale taking shelter from the rain. Some may be his neighbor digging for giant oysters.

Ms. McKibbin's Insomniac Trilobite. I found it lying on my desk one day, looking quite innocent: a handsome sham trilobite about 6 inches long, all made up in rock colored plaster of paris (Fig. 7). Trilobites are extinct marine animals that look something like giant sow bugs and my volunteers had recently worked a lot with them.

A very neatly filled out museum label was with this specimen. It read:

"*Halitosis hoaxi* (Boogaloo)

Nepenthe Heights, Calif."

This trilobite had been created by volunteer worker and Alliance member Jean McKibbin the previous night after alternative bouts with insomnia and trilobite-ridden nightmares. If you can capture your devil's image and name him correctly, then you exorcize him by adjuration, right? It worked for her, she got the sleep, and I got the graven image for our curiosa collection.

Not long afterwards, a new skyscraper was topped out in Westwood and the company decided that the main office should have a two story high interior wall depicting a fanciful cross section through part of the earth. This wall was to be cast in fiberglass panels and they

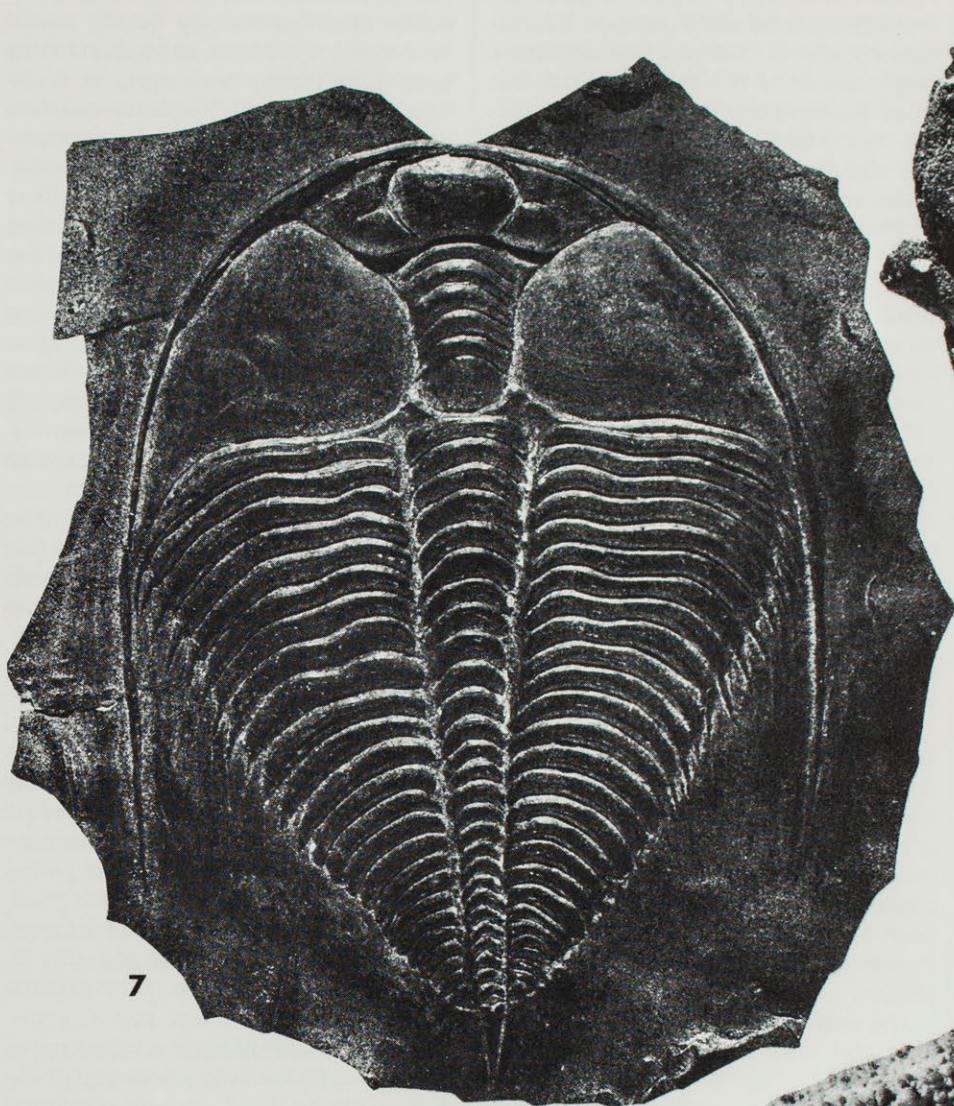
Figs. 7–10, all approximately natural size. See text for true identities.

Fig. 7. Ms. McKibbin's insomniac trilobite.

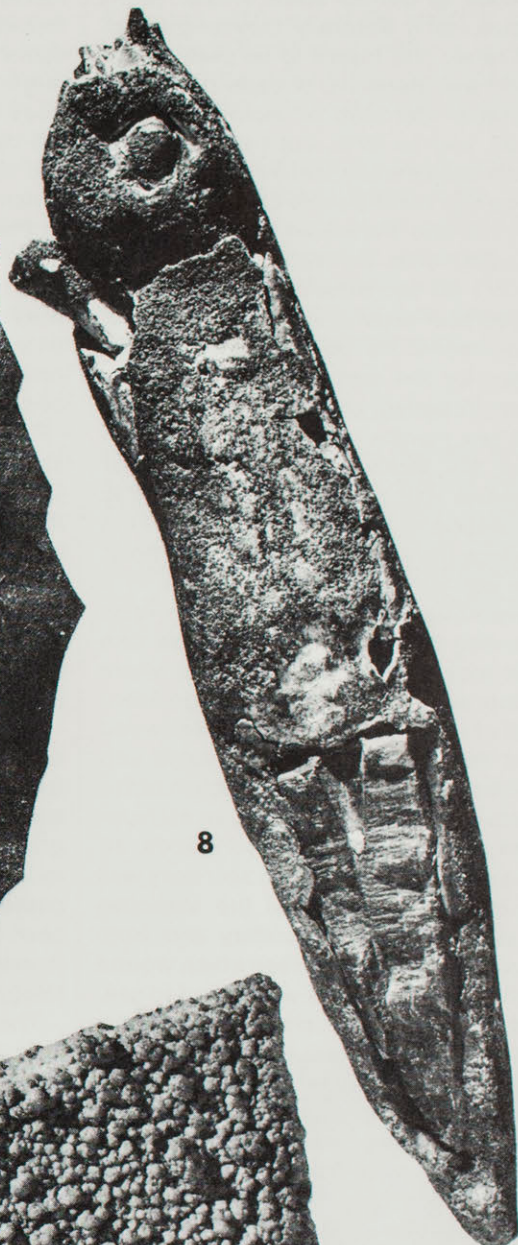
Fig. 8. The million dollar baby blue eyed half faked fossil squid.

Fig. 9. The heart like a rock cast in the sea (it was).

Fig. 10. Product from the instant fossil dragonfly factory.



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needed to borrow some fossils—pretty fossils—for it. Naturally, they rang me up.

I rarely find fossils to be pretty. They seem well preserved or badly preserved, correctly identified or incorrectly identified, and so forth, but I can't think of them aesthetically, although I acknowledge that other people can. Ms. McKibbin can and she knows where our most beautiful ones are filed.

So I let her show the man from the skyscraper around and help him select specimens. He borrowed them, cast them for the wall, and then returned them in perfect condition.

A few months later, during our lunch hour, Ms. McKibbin, I, and some other museum staff members, trooped over to Westwood to see the finished wall. First we took the elevator up to the 15th floor. We got out and found ourselves in a cavernous two story high room—and standing on the shore of a shallow lake that took up most of the space where a floor should have been. A magnificent wall of glass looked out over Westwood and the Santa Monica Mountains and another wall had the cross section of the earth's crust. In the lake was an archipelago of stepping stones and islands, on one of which a marooned secretary was typing busily. Some of the stepping stones led to the secretary and from there to a curved staircase which wound up in front of the wall we wanted to see. Jungle plants grew on the other islands.

I never understood it, but I liked it.

We made it safely to the island and the secretary permitted us to cross more stepping stones and to mount the staircase for a close look at the wall.

And what a wall! Volcanoes, sabretooth cats, ammonites, dinosaurs, rock strata, a working oil well, and I don't know what all. We climbed the staircase and examined higher and higher sections of the wall. On one of the uppermost turns I found myself face to face with *Halitosis hoaxi*. I nearly fell overboard. There it was, that exorcized dream, right in the wall with all the rest of the history of the earth.

"Jean," I said, "How did that get there?"

She assumed a simple village maiden pose (Giselle, Act I) and answered in a superbly innocent, high voice: "I don't know."

And then she said with a sly, sideways look, wrinkling her nose, "He liked it."

I've never dared ask for details but I'm sure there must be story there somewhere.

The Million Dollar Baby Blue Eyed Half

Faked Fossil Squid Legend. Squids are mollusks, related to the octopus, a rather squishy animal that you wouldn't think might occur in the fossil record, but does. We have on display the impression left by the arms of a lady squid as she laid her eggs on the bottom of the sea which covered Montana during the Age of Reptiles. The Field Museum in Chicago has a relatively complete fossil squid, down to the little hooks in the arms and the beak from the mouth, that dates from the even older Age of Amphibians. Such records of the soft bodies of squids are quite rare, however.

The hard internal skeletons of squids are abundant fossils at some localities. Cuttlebones used for caged birds are the internal skeletons of a living kind of squid. Belemnites are very common internal skeletons of an extinct kind of squid found in some rocks of the Age of Reptiles. They generally are dark gray and about the size and shape of cigars, and are found all over the world.

In our collections, there is a remarkable belemnite labeled "Fossil squid from mile high elevation at Shell, Wyoming" (Fig. 8). I can describe and photograph it but the circumstances surrounding its acquisition will have to be passed on to you third hand, having been told to me by George Kanakoff, a former Curator of Invertebrate Paleontology.

The entire specimen is about 7 inches long and obviously represents a mutilated squid. At one end there is a belemnite skeleton embedded in about the position that a paleontologist would expect it to have occupied in the living animal. At the other end there is an obvious head with broken arms and other structures one associates with squids. In particular, there are two large, handsome eyes. A quick glance suggests that the specimen is reddish sandstone but closer examination reveals that it is plaster of paris with red sand embedded in it. All is obviously a fake, except for the skeleton, which is real.

Mr. Kanakoff tells me that it was bought as a real fossil by his predecessor, who, thankfully for our fragile reputations, was not a highly trained paleontologist. This is obviously something that the honourable chairman of our Acquisitions Committee, Mr. C. V. Duff, has never heard about, because he recently told me: "We trust you guys when you put in a request for purchase, see, because as far as I know we've never been stung yet."

Well, C. V., we *once* got stung, al-

though some decades before your competent chairmanship, by buying a part fake fossil squid with large, handsome eyes—bright baby blue eyes, at that—which I wouldn't part with for a million dollars now. It's one of our nicest specimens from the Age of Chicanery.

The Heart Like a Rock Cast in the Sea (It Was). I have on my desk at this writing a specimen which some people believe to be a fossil human heart (Fig. 9). It also may be a traveling heart, one having reportedly been stolen in Egypt before 1925 while the one I have here was found in 1950 at Miles City, Montana. Are they the same specimen? Here are the stories:

The "heart" from Montana is on loan to us and may be given to us by the owner. I only hope he makes up his mind before it decides to go back to Miles City or Egypt so that we can lock it up safely with the rest of our peerless collection of such things.

The farmer who found it says that he showed it to reputable Montana surgeons, who told him that it was indeed a heart, either a man's or a pig's. My guess is that some of the surgeons were veterinarians. At any rate, I do believe it was examined by surgeons because there are some coarse saw marks on the "aorta."

So what is it? I have obtained the generous permission from an authority to quote a paragraph from 1971 number of *Terra* (Vol. 9, No. 3, p. 22):

"Septaria are globular shaped rocks that are criss-crossed by series of radiating cracks filled up with a mineral such as calcite. Some are thought to have formed rather mysteriously on the ocean floor as bodies of aluminous gel that eventually hardened on the outside. The interior was then supposed to have dehydrated and shrunk, causing the cracks to develop. The septaria were then buried and later, after the sea floor had become land, weathered out for you to find."

The key statement is that "septaria are . . . rocks." Geologists learn this in introductory courses and they are told that these rocks may look like fossils and be called pseudofossils. Most septarian pseudofossils look like turtle shells. In our case, the specimen from Montana looks like a heart, and the mineral filled cracks look like grotesque coronary arteries.

Good heart-shaped septaria are not common and they may have a whole folklore spun around them by the owners who may believe firmly that they are actual hearts.

My first public encounter with a septarian "heart" occurred by telephone several years ago and shortly afterwards, to my surprise, my comments appeared in a newspaper article. A reporter, not identifying himself as such, called and asked me about supposed fossil hearts. I told him about septaria. The next I heard of it, a newspaper clipping was being circulated with my comments and those of a septarian "heart" owner who stated that it had been given to him by a gentleman in 1925 who once had a pair (one was stolen mysteriously in Egypt, see) in gratitude for having recommended a doctor who changed his appearance from that of a decrepit 90-year-old to a frisky 21-year-old. In case you wonder, it was all done by standing the patient on his head and running off the bad blood and then pouring in some good blood. I'm reporting it, not recommending it.

And I'm not making it up, either.

Anyway, the felicitous results made the patient as generous as he was now youthful and he gave his informant the prized "fossil heart," described then as the only one left in existence.

What they didn't know was that the other "heart"—the stolen one—may have been still in existence and come out of Egypt to join the Natural History Museum of Los Angeles County after a layover at Miles City. Its current owner, Mr. Harry Derian, has the enviable opportunity of doing literally what we have all done figuratively: give his "heart" to the museum.

The Instant Fossil Dragonfly Factory. Nearly every year, I am asked to examine at least one "fossil" dragonfly that was purchased somewhere. These always look the same. They are reddish brown, glittery, flagstone shaped blocks with one beautifully spread, adult "fossil" dragonfly in exactly the center of the upper surface. We keep one in our collections (Fig. 10).

If you own one of these pretty specimens, look on the lower surface for some rusty grid shaped impressions. Chip away a corner and you will find that the interior is ordinary sandstone that has been encrusted with about a 1/16 inch thick layer of minute reddish brown crystals.

I have it on excellent authority that these decorative frauds were manufactured by an entrepreneur who caught dragonflies, glued them to slabs of sandstone, and placed the slabs on racks improvised from old refrigerator shelves in a pool of hot salt water fed

by an artesian well on the east side of the Salton Sea. When the salts had precipitated to the desired thickness onto the dragonflies and the sandstone slabs, the specimens were removed from the pool ready to be trucked away for sale, complete with impressions of the rusty refrigerator shelves.

Caveat emptor, you all. There are no known refrigerators in the fossil record, not even from Ice Age deposits.

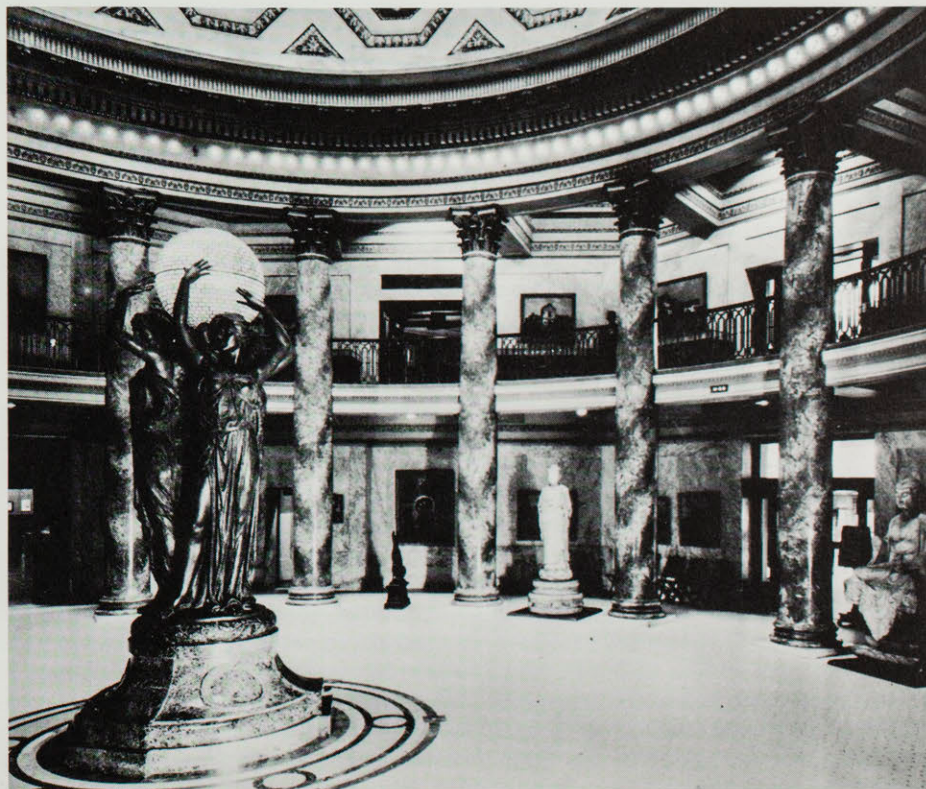
Now It's Your Turn. I hope that you've enjoyed this look at frauds. If there are any of these specimens that you would like to see, just call me up. Perhaps if the demand is as strong as it was the last time I wrote a piece for *Terra*, which was about concretions, I may ask Alliance member Lenor Raub to set up an exhibit of the frauds as she did of the concretions. If so, the new exhibit will be near the old one on the mezzanine of our Mineral Rotunda.

You know where that is, don't you? It's in the 1910 part of the building and is the magnificent room with the ornate dome and those Corinthian columns with the gorgeous, huge, red marble shafts (Fig. 11).

Actually, the shafts are not marble at all, but one of the cleverest of the plasterers' crafts, verging on art, called *scaglione*. The technique is centuries old. These great pillars, which were poured in a mold right in the rotunda, probably are our finest geological frauds.

Edward C. Wilson knows that the tickle bone is connected to the intellect bone. TERRA editors hope that Wilson, curator of invertebrate paleontology at Natural History Museum of Los Angeles County, will expand the above into a bestseller. This is his third TERRA sortie.

Fig. 11. Our gloriously columned 1910 rotunda in its heyday.



A Forest in a Castle

by Kate T. Steinitz



Written in honor of the eightieth birthday of Dr. Elmer Belt

Indoor-outdoor living, bringing nature into our rooms, doors opening flush to the garden level: this way of living would have been an impossible dream for Renaissance princes who had to protect themselves with giant walls in their fortresses and castles. And it would have been an unrealistic dream for citizens of wealth and importance in their urban palaces, so close together in narrow streets within the city walls.

Perhaps, then, it was a nostalgic longing for nature which made patterns of leaves and all sorts of greenery a favorite motif in the applied arts of the Renaissance. Large walls were covered with embroidered or woven hangings, *arezzi* or gobelins, called so after the great textile craftsman Jehan Gobelins who es-

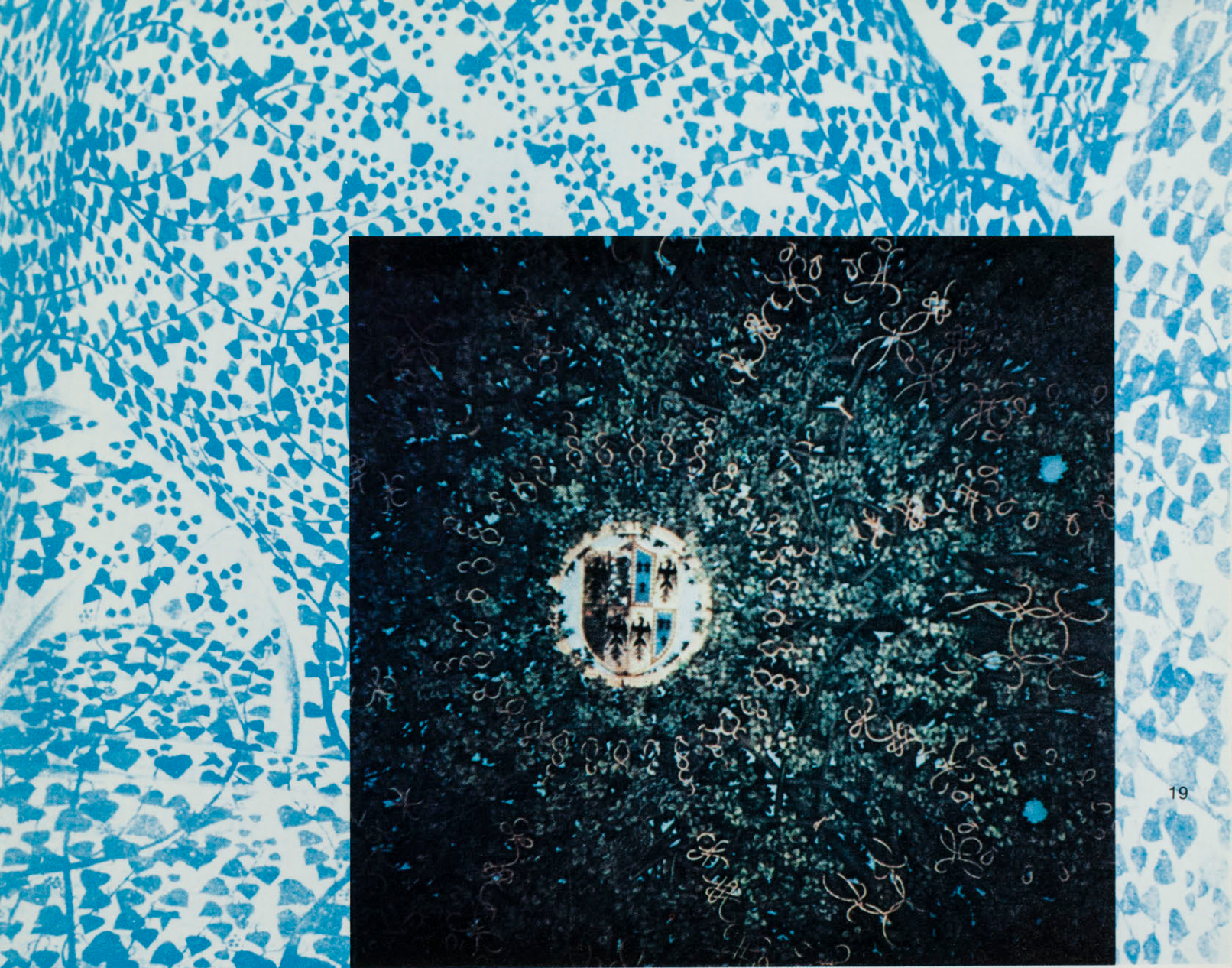
tablished his successful weaving plant in Paris in the middle of the 15th century.

Walking or driving along the rim of a forest we feel as if we were driving along a wall with embroidered greenery, and, reversed, a hall with gobelins transfers us into a real forest.

When Lodovico il Moro, Duke of Milan and patron of Leonardo da Vinci, commissioned the great artist in 1497 to decorate the hall in the north-west tower of the Castello Sforzesco in Milan, the choice of the subject was not new: the motif of greenery in order to convert the hall and its enormous vault into a forest. Leonardo agreed to finish the work within five months. This would have been his third gigantic work executed for the Duke of Milan. The first, the equestrian statue of Francesco Sforza, the Duke's father, a masterpiece of sculpture, was

destroyed by French soldiers before it was finished; the second, the Last Supper, is still in its place, in the dining hall of the monks of Santa Maria delle Grazie. We do not know whether the third, the decoration of the *Sala delle Asse*, ever was finished or not. It was totally ruined by events of war and negligence. It was forgotten until Professor Mueller-Walde, while working on Leonardo's biography in 1893-1894, discovered traces of the original mural.

The hall then was carefully restored under the direction of the Senator, architect Luca Beltrami, a prolific scholar of Leonardo. (*Leonardo e la Sala delle Asse nel Castello di Milano*, Milano, 1902). He published the most important documents regarding Leonardo's work in the Castello, such as a letter by the custodian Gualtiero addressed to the



Leonardo da Vinci's vault in the *Sala delle Asse*, restored.
Photographed 1951 by Kate T. Steinitz.

Duke, dated April 21, 1498, telling that "Magistro Leonardo" promises to have his work finished in December. Another document describes Leonardo's preoccupation with decorative tree patterns, as used in the *Salla delle Asse* (G. Paolo Lomazzo's *Trattato dell' Arte della Pittura*, Milan, 1584 libro VI, p. 430):

... "a very beautiful invention of Leonardo has been found in the trees having all the small branches form bizarre groups, interweaving them . . . also Bramante. . . ."

Leonardo himself, in a note in Codex Atlanticus (fol. 225) mentions *gruppi* (groups or knots) of Bramante. It is most likely that Leonardo discussed the intricate design of the decoration in the Castello with his friend, the great architect Donato Bramante, who shared his interest in the symbolic ornament; it is

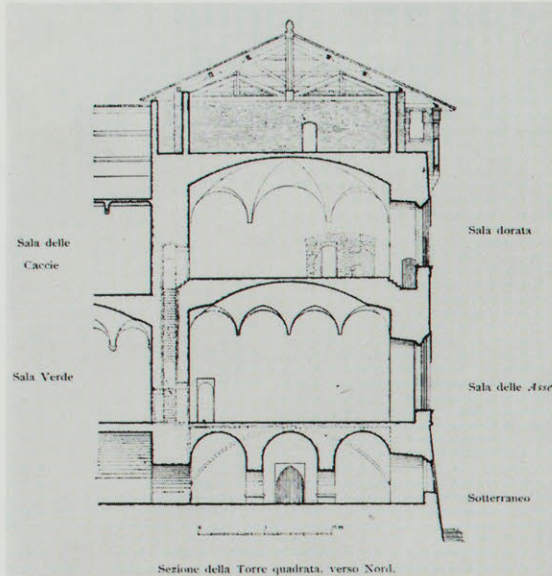
not impossible that Bramante collaborated with Leonardo on the project. Beltrami illustrates his book with many diagrams of Leonardo's motif with the manifold variations he discovered.

As an architect, Bramante had great understanding of Leonardo's system. Leonardo would never have decorated any part of an architectural structure without coordinating the decoration with the architecture. The traces of Leonardo's original painting which have been found in the course of the years by further work of restorers were enough to confirm Beltrami's concept. Huge stems, rising to the lunettes under the enormous vault branched out into an abundant growth of leaves. Yet branches and leaves do not spread out wildly and chaotically. The intertwining branches are organized by golden cords which

wind from stem to stem in a regular pattern of "gruppi" (knots) towards the center of the vault which carries the Sforza Coat of Arms within a circle of light, as if it were an opening of the vault.

The reconstruction shows how ingeniously the pattern of leaves dissolves into the simulated sky. There are eight small openings in the overall greenery as if the daylight could penetrate into the interior. Below, the main stems carry four tables with important inscriptions which have been partly preserved. They throw light on the history of the Sforza regime and Lodovico's fate. The last table reports his flight from the French invaders in 1499 and his final defeat.

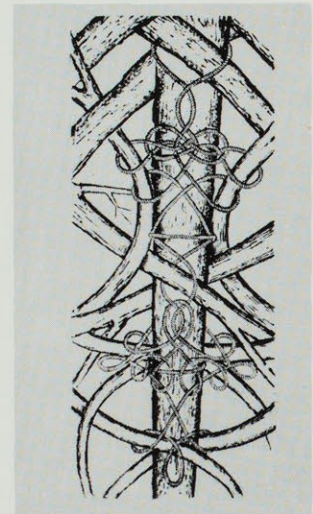
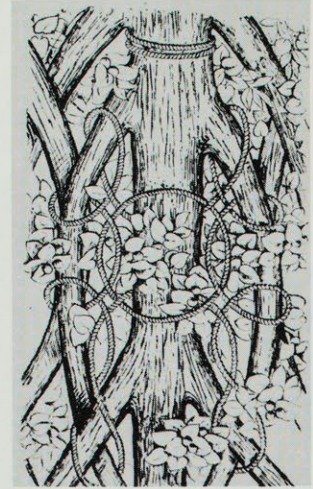
Leonardo's rendering seems an ideal solution to integrating naturalistic forms of growth and architectural construction. The artist had deeply penetrated into the



Cross section of the north-west Tower of the Castello Sforzesco, Milan with the Sala delle Asse.



Leonardo's studies of ramifications
MS.M. Paris, Institut de France



Luca Beltrami's reconstructions of Leonardo's design

basic principles of growth. In Leonardo's manuscripts, Codex Atlanticus, Ms. G. and others, and in the sixth book of his *Treatise on Painting* (Cod. Vat/Urbina 1270) there are many observations on the growth of trees: "Of the center of the thickness of trees;" "Of the proportion of the branches to their nourishment;" "Of the form that trees have where they approach their roots;" "Of the growth of trees and which direction they grow;" "Of the growth of leaves upon their stems;" and so on.

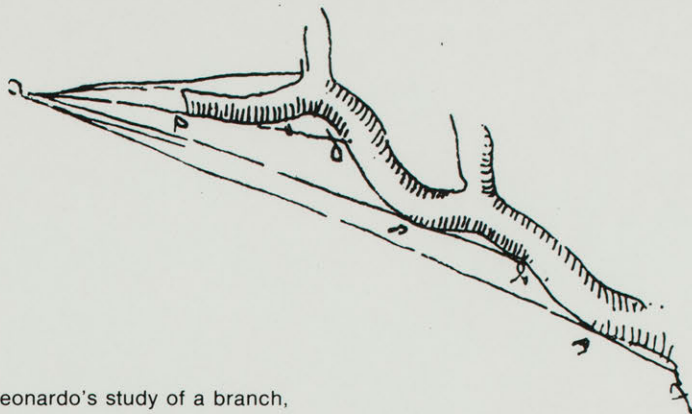
Leonardo's apparently playful sketches of knots can also be found on many pages of his manuscripts. They are certainly more than "doodlings," more than an amusement of his pen. Even when used playfully, these unilinear scribbles have a meaning. The continuous line in concatenations, knots, laby-

rinths and mazes runs unbroken to eternity through many forms of art from its beginning in Asia and throughout Europe. It appears in early illuminated manuscripts and in the historiated initials in Renaissance printing. This is lucidly demonstrated by Coomaraswamy in his essay on Durer's and Leonardo's knot systems and concatenations, and also by the architect-restorer, Beltrami.

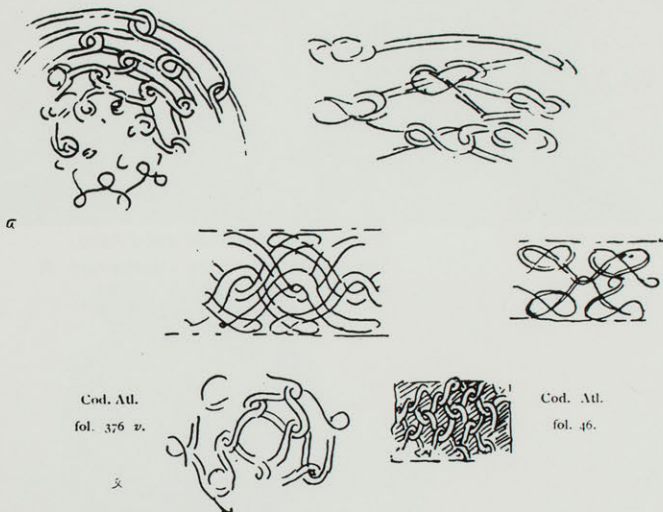
In spite of his merits Beltrami has been severely criticized for the restoration of the Hall. It has been said it looked now like a beer cellar (*Gambrinus Halle*). It is true that the execution by the painter Rusco turned out to be too heavy, the color of the leaves too dark green, the gold of the cords too glaring. And this, unfortunately, obscured the sound construction of the design.

When I first visited the *Sala delle Asse*

the new restorations had not started. My photograph of the vault still shows the state of the Beltrami reconstruction. When I saw it again ten years later, it had a very different aspect. The glaring gold had been removed along with the heavy dark green. The paintings of the walls were perhaps less appealing to the general public, but those who knew Leonardo's theory of aerial perspective, color and light were delighted. The heaviness of earth had given space to a soft airy quality of color; the leaves seemed to vibrate in the light, although their forms remained clear enough to show all the variations in design which Beltrami had reconstructed in diagrams. A new section painted in grisaille had been rediscovered when layers of stucco were removed. A lower part of the wall showed a sort of cross section through



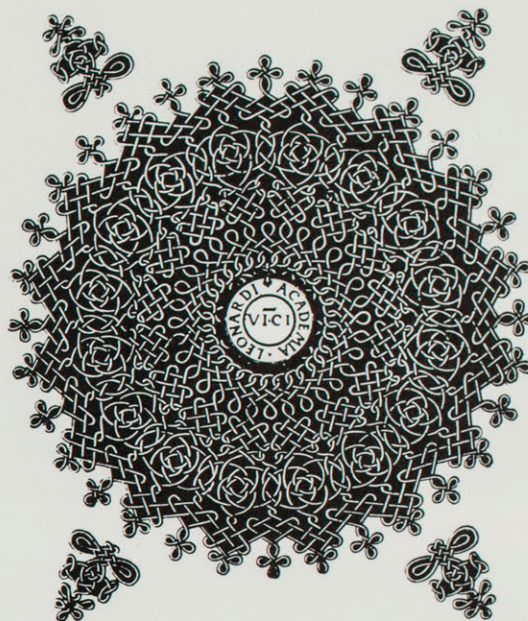
Leonardo's study of a branch,
Ms.M. Paris, Institut de France



Cod. Atl.
fol. 376 v.

Cod. Atl.
fol. 46.

Some of Leonardo's studies of
interlaced cords and bands.
Codex Atlanticus, fols. 376 and
46. Milan, Ambrosiana



Copperengraving after Leonardo

the ground in which the trees were rooted, an intricate pattern of stones, layers of earth and roots.

Professor Joseph Gantner of Basel, an addict of Leonardo's cosmology, was able to discover in the ground a sort of graveyard with the heads of dead corpses bandaged in the Italian way of burials. His conclusion was that Leonardo wanted to symbolize the beginning and end of life, growth and decay, new life rising out of death—a beautiful thought, but unfortunately neither I, nor several other Leonardo scholars who happened to examine the vault with me, were able to trace the heads of the dead.

As great and poetic as Professor Gantner's interpretation seems, I think that Leonardo is even closer to the heart of creation than Gantner's idea of it. Without clear evidence and almost with-

out verbal description, just by the subtle touch of his pencil or brush Leonardo touched that primal pulse. Leonardo himself used the word subtle, *sottile*, frequently in his *Treatise on Painting*.

Was the decoration of the *Sala delle Asse* finished when the French occupied Milan in 1499?

The Duke of Milan, on his flight from the French invaders was captured and imprisoned. He died as a prisoner in the Castle of Loches, 1508. But Leonardo's decoration of the *Sala delle Asse* was seen and admired by builders, artists and architects. We can trace its influence in the Palazzo del Giardino, the Garden Palace of Vespasiano Gonzaga, built in the middle of the 16th century, in his experimental "ideal city" La Sabbioneta, near Mantua. The short stairway which leads from Vespasiano's studio to the

garden is decorated with a maze of ivy leaves to simulate a pergola.

Although there is no geometrical order, no cords, no knots, symbols of the complications of life, the direct influence of the *Sala delle Asse* is obvious as the foliage covers wall and vault. The ivy stems and leaves bring the freshness of outdoors into the somber inside of the study; ramifications, old branches full of leaves painted in imitation of nature, lead the way to the garden—an invitation to outdoor living. Compared to Leonardo's majestic vault the staircase in the Sabbioneta is only a playful variation.

Leonardo's decoration does not lead to the out-of-doors. From the fragments that have been preserved one can conclude that, on the contrary, it emphasized the function of the architecture, to enclose an interior for solemn gather-



The wall of the Sala delle Asse.
Trees with branches intertwined. A
recent restoration.

ings. In poetry and prose a forest with gigantic branches closing above has been compared to a dome; we are dwarfed by its greatness. Leonardo transcended nature, however, with his adaptation of the eternal knot system which, with its symbolism, meant more to him than ornament.

As Leonardo did not reveal in words what it meant to him, we may conclude with a few lines from Dante's Paradiso, which Leonardo certainly knew.

*"Concreato fu ordine e costrutto
Alle sustanze: e quelle furon cima
Nel mondo in che puro atto fu prodotto;*

*Puro potenza tenne la parte ima;
Nellmezzo strinse potenza con alto
Tal vime, che gia mai non si divina."*
Paradiso, Canto XXXIX, 31-36.

*"Order was constituted and created in
substances; and the world's crowning
grace were these, wherein pure act was
generated.*

*Pure potency retained the lowest place;
midway did act and potence interweave
such withies (willows) as can never dis-
enlace."*

Translation by Melville Best Anderson.
(from the Dante Edition printed by
John Henry Nash, San Francisco)

*Kate T. Steinitz is one of the leading
authorities on Leonardo da Vinci, and
her scholarship in this area is well
known. The Elmer Belt Library of Vin-
ciana, donated to UCLA by its founder,
was developed under the librarianship
of Mrs. Steinitz; it is equalled only by the
Racolta Vinciana in Milan.*

*Mrs. Steinitz has written hundreds of
articles on art and artists from the 15th
century to the present. Her own drawing
and painting was exhibited in New York
and is included in the Yale University
Collection. TERRA is honored to have a
contribution from her.*

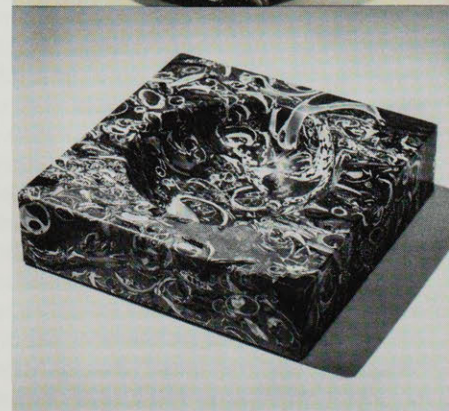
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Cube of fossilstone cut from bore hole cobble.



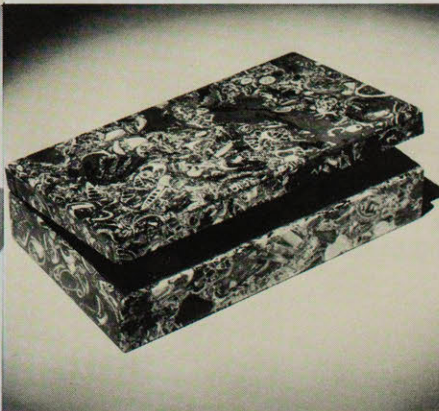
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On the Trail of the Rat Pack

by **Betty Birdsall**
and **Elizabeth Wright**

Existence of a Rat Pack within the walls of the Museum has long been knowledge confined to a few cognoscenti. A meager leak here and there set rumors flying, but not until publication of this article has specific information been divulged to the public about the mysterious Rat Pack.

Proper Names: Helen Abraham, Betty Birdsall, Louise Bramlett (last year), Jean Bull, Joan Clark, Thyra Sharp.

Sex: Female

Distinguishing traits: Inquisitive, active, involved, educable.

Habitat: West wing of second floor

Habits: Diurnal . . . emerge Tuesdays

Life Histories: Nurses (Bull and Clark), Secretaries (Birdsall, Abraham and Bramlett), Teacher (Sharp)

Follow a trail via the Hall of Exotic Mammals, through a door marked "Private" to the world of the Rat Pack. Here, in an aura of disinfectants and preservatives, are revealed two large freezers, a curious-looking box, a cage festooned with who-knows-what, stainless steel sink and, down the center of the room, a long, white table. On the table are skinning boards complete with corn meal, and accompanied with labels, pins, needles, thread, pliers, forceps, scalpels, surgical scissors, cotton and wire.

Atop the chest freezer, a lamp plays on rigid forms of three frozen field mice in the process of thawing. Beside the sink several study skins, neatly anchored, repose on a pinning board, their carefully-groomed pelage attesting to the efficiency of a nearby toothbrush. The freezer, closed with difficulty, serves as repository for a potpourri of deer mice (*Peromyscus*), kangaroo rats (*Dipodomys*), weasels, pack rats, voles, pocket mice and other mysteries . . . all awaiting transformation into scientific study specimens.

This, then, is the ecological niche of the Rat Pack, those dedicated Curatorial Docents who, banding together weekly, meet over the skinning and pinning boards to prepare the skins, skulls and oftentimes skeletal remains of small mammals.

For a moment, let us leave the laboratory and probe dim history from whence emerge some interesting statistics. Sixty years ago, in 1913, well within the memory of many Alliance members, the mammal collection at the Museum numbered zero. By 1928, it numbered 1,130. By 1971, the Natural History Museum of Los Angeles County could proudly claim the largest mammal collection of any public museum west of Chicago, with a

count of 65,000 mammal specimens. Obviously this was a happy situation not effected solely by the process of natural increase, but supplemented by private and museum-sponsored expeditions, grant-supported field studies, gifts, purchases and exchanges.

One might well question the "why?" for acquisition of so large a number of stuffed and classified creatures. The inquisitive mind of man is the answer. Still extant and attesting to man's curiosity are pre-Linnaean specimens of mammals and other animals. The British Museum of Natural History as well as the museums of Berlin, Vienna and Paris have old study specimens (both pickled and stuffed) dating to the late 1700's. Many of the earliest expeditions exploring the New World returned to Europe with the first known accounts of our native faunas and floras. Modern man's technological intrusion into his environment accelerates the extinction of some species. Coupled with this is the scientist's awareness of the imperative need for a record of existing mammalian life for ongoing history.

Small mammals, secretive, highly intelligent and frequently nocturnal, demand dedicated investigation. Previous haphazard conclusions about mammalian life make necessary present efficient and painstaking efforts to detail the life and times of our small-mammal population.

Although the question, "How?" may never plague the average citizen, readers of *Terra* (being out of the ordinary) will undoubtedly welcome the following exotic recipe . . . a Rat Pack special.

How to Stuff a Wild Dipodomys

If stiff-relax. Measure in millimeters total length; tail, hind foot and ear. Make mid-line incision from below rib cage to near vent. (Don't rupture the body wall!) Keep dry with generous amounts of corn meal . . . turn down skin, beginning at lower extremities, and push (don't pull) it off the body. Remove hind legs just as one would remove slacks. Then sever bones at ankles. Carefully slip tail from skin (like removing finger from a tight rubber glove). Next, remove forelegs in similar fashion. Ease skin up and over skull toward nose. Pull ear tubes loose from bone, cut skin attachments at eyes and nose. Now, we have a little *Dipodomys* coat ready for stuffing.

Place tightly-rolled cotton batting body, gripped by forceps, atop inside-out skin. Turn right-side-out over head, working from tip of nose and adjusting



Docents Betty Birdsall, Helen Abraham, and Jean Bull skin kit fox over tray of absorbent yellow corn meal.



Docents Thyra Sharp and Louise Bramlett hang cat for skinning.

eyes, ears, etc. Tuck in at rump. Next, cut front leg wires and insert all the way into paw pads, legs are now parallel to body with paws positioned under cheeks. Delicately wrap rear legs and tail wires with cotton, insert and position straight to the rear. Sew up incision. Pin to drying board. Brush pelage. Identify sex from carcass, measure and note length of testes (σ), ovaries (O) and number and size of embryos, if present. When properly garnished with generous amounts of accurate information, will serve innumerable scientists for years to come.

The "garnish" mentioned in the above recipe is never optional and consists of two tags, one of which is tied to a study skin above its right heel.

The second tag is attached to the skull. Preparation of the skull begins after the animal's skin is completely removed. At that point, the head is disassociated from the remains, the eyes and tongue removed and brains flushed from the skull using a large hypodermic needle. The skull tag is attached through the lower jaw.

If the skin proves to be in poor condition, it is discarded and a skeletal specimen, with skull attached, is retained.

That strangely-festooned cage noted upon our arrival turns out to be a drying cage for tiny skulls and skeletons. After approximately seven days these skulls are transferred from the drying cage to the 'Bug Room.' Here, dermestid beetles and their larvae consume all remaining flesh (while leaving connecting ligaments undisturbed).

The preparation of small skins can vary anywhere from an optimistic twenty minutes to considerably longer should difficulty be encountered in determining sex (frequently a factor in small mammalian species) or, horrors, if a foot should come off or a tail be inadvertently turned inside-out. Total processing time (exclusive of preparation) includes unpacking, identification, preparing for bug room, degreasing bones in a diluted ammonia solution, storage and cataloguing, averages 121 hours per specimen. This estimation pertains to mammals ranging in size from shrews to deer. The average cost of processing (excluding preparation) is \$2.15 per specimen.

Between 1967 and 1971 our Mammal Collection made 113 loans involving 2,701 specimens to eighty-two U. S. institutions and five foreign countries. In cooperation with the Southern California Academy of Sciences, it was utilized in a recent environmental survey of endan-

gered species for the Los Angeles Planning Commission. The mid-sixties found the Natural History Museum cooperating in a U. S. Army grant expedition to Costa Rica to study mammals and their ectoparasites. Our significant mammalian holdings from North and South America as well as from Africa attract scientists from all parts of the world. The Natural History Museum's marine mammal collection, the most extensive on the West Coast, ranks second in the United States, while our North Pacific cetacean collection (whales, dolphins, porpoises) is the finest in the world.

The acquisition, maintenance and continuing growth of so important a collection obviously involves a large number of people . . . and, included among them, are the Rat Pack, skilled and dedicated Curatorial Docents wading knee-deep in a tributary feeding into the great mainstream of scientific knowledge.

Betty Birdsall has been a curatorial docent at the Natural History Museum of Los Angeles County for ten years, working in many museum departments and for the last two years in mammalogy. At present, she volunteers one day a week as a skinner, and another day running an answering service in two Museum departments helping curators and answering public questions.

Elizabeth Wright is going into her third year as a tour guide at the Natural History Museum of Los Angeles County. She edits the docents' monthly news-sheet, "Docent Doings."

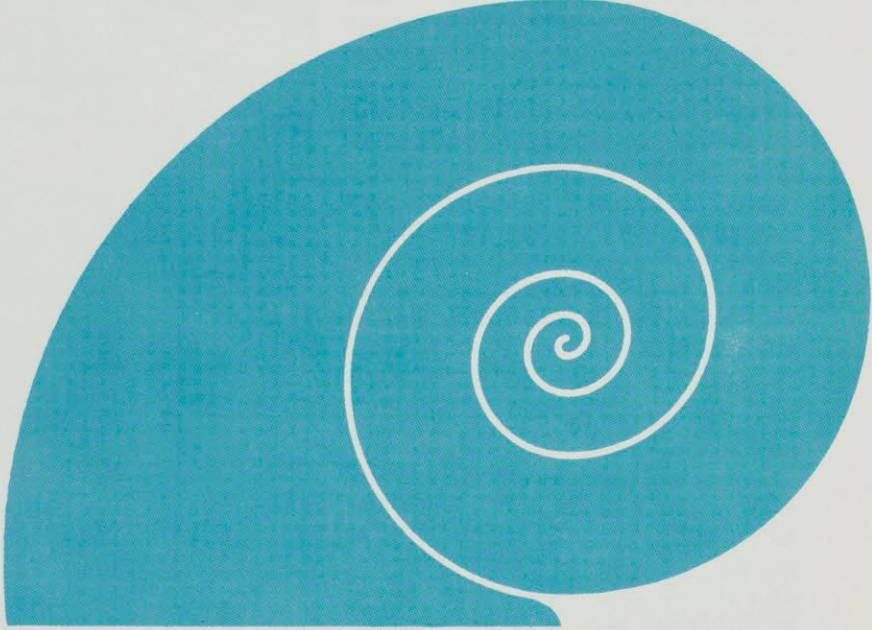
This is the first TERRA article for Docents Birdsall and Wright.



Docent Louise Bramlett runs incision from paw pad down leg of bobcat preparatory to skinning.



Docents Helen Abraham and Jean Bull skin leg skin from kit fox.



Molluscan Invaders

*A new Florida
resident—Californians beware*

Achatina fulica gets even larger
than this one held by Dr. William
Clench of Harvard University. It is
also the most potentially
dangerous of all our molluscan
invaders.

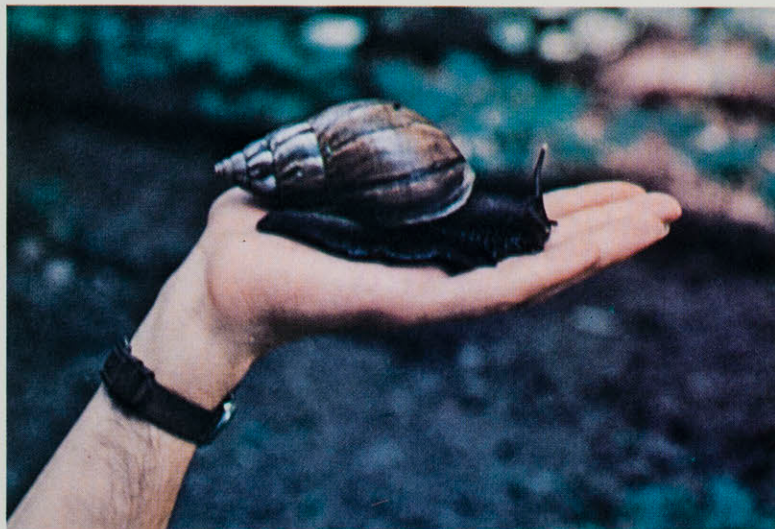


photo by Ruth Turner



photos by David K. Mulliner

Gardener's nightmare—But here to stay

Helix aspersa is the common garden snail introduced from Europe in the early 1800's. It seems to thrive in our climate.

by Gale G. Sphon

Are snails eating the paint off your house? It's the Giant African Snail.

Have you ever been stopped at the California Agriculture Inspection Station upon entering the state? Or, have you had your luggage checked by the U.S. Customs when returning from abroad? I'm sure we've all had this experience one time or another. I'm also sure we've all wondered just what good it did. Well, there are many reasons. One is to keep out agricultural pests. *Achatina fulica* is one such pest, and it is better known as the Giant African Snail.

This snail pest left its home grounds in Africa prior to 1800 and by 1850 had made its way to southeast Asia. By the 1930's it was well established in some of the Pacific island groups, including Hawaii where it has become a major pest. Until the mid 1960's the United

States had been successful in keeping it out of the continental U.S. However, in 1966 there was a report that it had been found in Florida. The report was investigated and found to be true. A viable, living and breeding population was found in the Miami area. By 1971 several additional populations were discovered and it is to be expected that even more will come to light. These populations have been traced back to a young boy who had been vacationing in Hawaii and had brought home three of the snails with him as "souvenirs." By 1970 over 15,000 specimens of the Giant African Snail had been collected in Florida.

The Giant African Snail has been known to do tremendous damage to crops such as cabbage, carrots, cotton, lettuce, melons, peanuts, pumpkins, rad-

ishes, tomatoes and yams. Obviously it can become an extremely dangerous pest. It has even been known to eat the paint off houses.

We do have other introduced mollusks in the western United States. Some like the common garden snail (*Helix aspersa*) are tremendous pests in orchards and home gardens. It seems to be a hopeless battle to try and exterminate this species. While it is a horrendous pest to the gardener, you might say that it has also had a beneficial effect. Think about all the jobs it has created for people the next time you use "Snarol" or some other such product.

The common garden snail is a native of Europe and was brought to California originally for food purposes. It probably arrived sometime in the early 1800's. This is not the species that is ordinarily



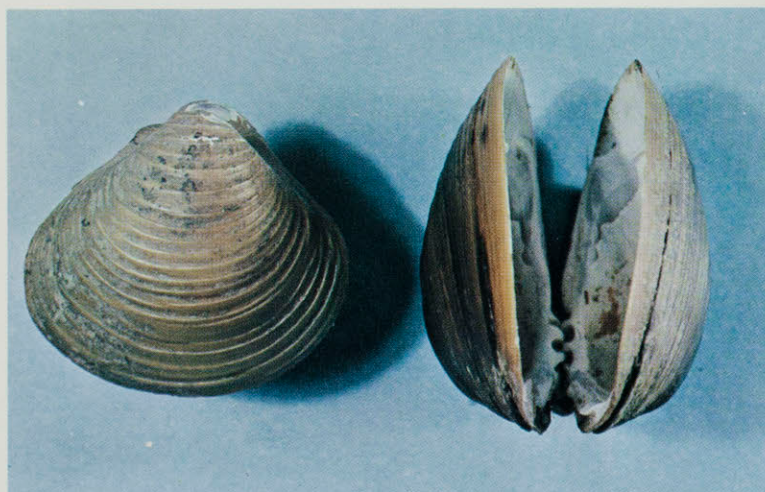
Oysters on the half-shell—A gourmet's choice

Ostrea sp., one of the several large industry in Northern California, Oregon and coast that form the basis for a Washington.



Esgargot—An epicurian delight

Helix pomatia is the species of snail usually used for food. It has never readily naturalized on the west coast.



Drains clogged?—Use D . . .

Corbicula fluminea is widespread throughout the western U.S. and causes large amounts of damage to irrigation systems and canals.



An oriental delicacy—But not Won Ton

Viviparus stelmaphorus was originally from China, but has now spread throughout the delta region of California.

used for escargot. The species that is generally used is *Helix pomatia*, a larger, more "plump" individual. While it has been introduced many times, *Helix pomatia* does not seem to do well in California.

Oysters (several species of them) have been purposely introduced for obvious reasons, and they form the basis of a large industry on the West Coast. Along with the introduction of the oysters came a whole host of their natural enemies. Many of these have not readily adapted or have been assiduously eradicated as soon as they were found. One of these natural enemies, the Eastern Oyster Drill, *Urosalpinx cinereus*, has become established in the oyster beds in the San Francisco area and there seems to be no getting rid of it.

One large whelk (*Busycon canali-*

catus) from the East Coast has also become established in San Francisco Bay and has been there since at least 1938. It's of no commercial value, it does no harm to anything that we know of, but yet it's rather nice to find such a large colorful shell among our smaller, more drab, West Coast mollusks.

Viviparus stelmaphorus is a large fresh water snail that originally came from China. It was first noticed in 1891 at a Chinese vegetable store in San Francisco. In fact, it can still be purchased at some of the Chinese markets in that city. It has now spread throughout the delta region of the Sacramento and San Joaquin Rivers and northward into British Columbia, Canada.

A major invader from Asia is a fresh water clam that has been causing considerable problems in the irrigation

canals of the western United States. This menace is known by the name of *Corbicula fluminea*. At one pumping station in the irrigation system of the Imperial Valley in California the population of *Corbicula* was estimated to be 1½ million specimens. *Corbicula* populations become so dense that they have been known to clog drainage systems. At one pumping station in central California the young attached themselves to the tubing and continued to grow until they blocked the flow of water.

According to the late Dr. G. Dallas Hanna of the California Academy of Sciences, there are approximately 100 species of land, freshwater, and marine mollusks that have accidentally or purposely been introduced into the western United States. The majority have not become established and even most of



Oysterman's terror—But a true gourmet

Urosalpinx cinerus came with the oysters from the east coast. It will probably show up anywhere there are oysters.



A friendly visitor—No fuss, no muss

Busycon caniculata is an immigrant from the east coast now firmly established and breeding in San Francisco Bay. It can reach a length of four inches. It seems to do no harm or create any danger to anything.

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those that have successfully "invaded" us, do little or no damage. However, it really only takes one such as the Giant African Snail to make all the customs and agriculture inspections worthwhile. Think about it next time, and DON'T bring souvenir snails home alive!

Gale Sphon proved the glamour of the snail when he wrote about the garden variety's relative, the nudibranchs, for TERRA, in an article titled Psychedelic Slugs. He is a curatorial assistant in invertebrate zoology, Natural History Museum of Los Angeles County.

The slow way up:
Giant Snails climbing in Makiki Heights, Oahu, Hawaii



Photo by Dr. Albert R. Mead

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